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Otitis media with effusion in children: current management

Peter J Robb
Ian Williamson

Abstract

Otitis Media with Effusion (OME, 'glue ear') is the commonest cause of childhood hearing loss. Because the condition fluctuates, initial management of otitis media with effusion is audiometric confirmation and quantification of any hearing loss involved, explanation to parents or carers and watchful waiting with continued audiometric monitoring.

Neither medical treatments nor "complementary/alternative" treatments have been proven to be effective in the management of otitis media with effusion. Insertion of ventilation tubes (grommets) for children over 3 years of age with a bilateral hearing impairment associated with otitis media with effusion, who have failed watchful waiting, is effective in restoring hearing thresholds. The hearing returns to normal almost immediately. While normal auditory thresholds are the surrogate marker following surgical intervention, improvement in quality of life, social and educational performance are recognized but so far not well measured in trials, and not customary in routine clinical service.

Where adenoidectomy can additionally be justified in persistent OME, the combination of ventilation tubes and adenoidectomy in such children is broadly beneficial to terms of hearing, respiratory and related health and to development. This benefit is sustained for over 2 years after intervention and is cost-effective.

For children with persistent glue ear under the age of 3 years, there is very limited evidence from clinical trials on which to base decision-making. There is also no good evidence for the benefits of surgical intervention for children with unilateral effusion and hearing loss, even if persistent. Clinical experience from adults with unilateral glue ear suggests that in a normally hearing individual, sudden reduction in hearing from one ear is unexpectedly disabling. Grommets may however be helpful for younger children with frequent, recurrent acute otitis media and perforation, refractory to prophylactic antibiotic treatment. In this situation the primary intention of surgery is not to improve hearing, which is usually not affected in a persistent way, but to protect the tympanic membrane from repeated, and sometimes, permanent perforation.

Keywords management; otitis media with effusion; paediatric ENT

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Introduction

OME is the current disease name for presence of fluid in the middle ear, varying from serous to thick and mucoid, causing a temporary, reversible hearing loss. Middle ear fluid (MEF) is a non-diagnostic term used to describe the state when avoiding the implications of a serious form or a long history. "Glue ear", traditionally and still in North America retained for an extreme non-resolving form, has become the dominant popular and to an extent clinical name in UK. While bacteria may remain present in the fluid, (probably as part of a biofilm infection), glue ear is usually not associated with the acute otalgia, fever or malaise characteristic of acute otitis media (AOM), which can precede or follow OME. Instead, the concerns are about behaviour, language development, cognitive performance and quality of life.

While OME was recognized by Hippocrates, the first formal myringotomy was not described until 1649 and only much later, in 1801, did Sir Astley Cooper report to the Royal Society that myringotomy could improve hearing. It was not until 1965 that Teflon[®] became available as a suitably inert material for eardrum ventilation tubes ('grommets', tympanostomy tubes). Since then, surgical intervention for OME has increased rapidly and disproportionately across different countries with 715 000 insertion operations reported in the United States in 2006. In the UK, (where the rate has always been much lower), the numbers and regional variations in surgical intervention rates attracted the attention of public health physicians and health economists, leading them to the hypothesis that ENT surgeons were inserting VTs largely to placate middle-class parents whose children were underperforming at school and to fill a surgical activity void left by the reduction in tonsillectomy rates; A public health physician in the 1980's coined a tabloid-style headline, 'glue ear – the new dyslexia', and followed on with "...The need of surgeons to fill the vacuum caused by the decline in the number of adenotonsillectomies, and the fact that a diagnosis of glue ear legitimises the continued use of these operations, [grommets],may have contributed to the current epidemic of surgery for glue ear in children....." Ten years later, the same author took a more reflective view, stating, "the waning of the epidemic should come as no surprise. Most health technologies go through a diffusion cycle of adoption, widespread use, over enthusiastic application, before a period of more appropriate use when more stringent criteria are adopted."

In the last 20 years, the management of OME has remained both politically and economically contentious. The annual VT intervention rate in England and Wales has steadily fallen from 40 000 in 1995, to 25 000 in 2005. In England and Wales, the rate remains much lower than in other developed countries with extant data at 2/1000 children, compared to 8/1000 in Canada and 20/1000 in the Netherlands. Nevertheless, VT surgery continues to feature high on commissioners' agendas as a 'low priority procedure' of 'limited clinical effectiveness'.

When, in 2006, the Department of Health directed the National Institute for Health and Clinical Excellence (NICE), to develop a suite of short guidelines of 'ineffective practice reviews', including grommet surgery as one of the first, audiologists, paediatricians and ENT surgeons uniformly expressed concern. NICE then apologized unreservedly to the professionals gathered for this biased misnaming of the heading under which the initiative had been launched. In due course, NICE produced

a high quality guideline without a partisan agenda, reflecting the conservative, effective practice to which most clinicians were already adhering.

Aetiology

Otitis media with effusion is the most common cause of hearing impairment in children. About 85% of children will experience an episode of otitis media with effusion during childhood. There is a bimodal peak of incidence at two and 5 years of age, with 50% of episodes of OME resolving spontaneously within 3 months. Not feeding infants breast milk and attendance at day care increase the likelihood of OME and there is a small gender effect with males more affected. A seasonal variation in persistence of effusion means that children presenting with OME in the autumn have a lower chance of spontaneous resolution – it tends already to have endured longer. Of all the compounding factors, the most important management issue is advice against smoking by parent and carers.

Traditional teaching described the development of OME as a loss of ventilation and pressure equalization in the middle ear due to adenoidal hypertrophy and blockage of the Eustachian tube but the importance of these factors in physical anatomy is now considered minor. Emerging evidence indicates that, following upper respiratory tract infection biofilm activity in the adenoid produces a cascade of immune mediators, causing inflammation and upregulation of mucin genes in the middle ear mucosa, with associated reduction of ciliary function and clearance. It is likely that middle ear ventilation helps disrupt the biofilm infection by increasing and maintaining a high middle ear oxygen tension for this to persist at least while the ventilation is maintained.

Assessment

Within the restrictive gate keeping of the UK's National Health Service, hearing loss is by no means the dominant concern and trigger for presentation to primary care. Instead, poor speech and language development, inattentiveness in class, behavioural concerns and reduced or poor social interaction with other children are commonly reported. In younger children, parents sometimes report poor balance. The signs and symptoms aggregate across these and further dimensions to influence the child and family's quality of life.

It is important to confirm a normal pregnancy, delivery and neonatal period, and that neonatal hearing screening was performed and reported as normal. A very small number of children may pass neonatal hearing screening and have or develop a sensorineural hearing loss during infancy. Whilst too rare to support trial information, these reasonably justify earlier and more attentive surgical management of OME if concern exists about a mixed hearing loss. Children with comorbidities (e.g. Down's syndrome, cleft palate) are more commonly affected by OME, which is usually more persistent.

An experienced otoscopist will usually detect middle ear effusion with a bright, halogen otoscope. In primary care, the diagnosis is most often based on historical features such as recurrent episodes of otitis media or developmental concerns, with subsequent confirmation made by audiometric assessment. Children under the age of 4 years should be referred to a community paediatric audiology (second tier) clinic. Age-appropriate hearing

assessment, combined with tympanometry is confirmatory. Children of 4 years age and above, in the absence of cognitive or behavioural co-morbidity, can be assessed in a general hospital paediatric ENT clinic, where both audiometry and clinical assessment can be carried out at the same visit.

When OME is confirmed, active monitoring of hearing over a three-month period is recommended. Depending on local access to secondary care children's ENT services, it is prudent to make the referral to ENT at the beginning of the watchful waiting period, so that if resolution fails to occur, surgical intervention will be timely in minimising secondary disabilities. The benchmark for hearing loss due to bilateral OME is hearing in the better ear of 25–30 dBHL or worse, averaged at 0.5, 1, 2 and 4 kHz. Tympanometry will typically demonstrate reduced middle ear compliance, with Jerger type B or C traces. Children demonstrating persistent bilateral OME as deemed likely from the history or audiometry, should be referred for consideration of surgical management. It is also important and in future will be possible to make more child-centred holistic assessments, that affect the family's quality of life, and the finding of critical impairment also justifies early referral.

Similarly, where the impact of the hearing loss, although less than 25–30 dBHL, is judged to have a significant impact on the child's development, social skills or educational attainment, surgery may be appropriate.

Management

For most children with persistent OME, who come through the UK primary care gate-keeping system, insertion of ventilation tubes is indicated. Regular use of nasal autoinflation might be helpful during the watchful waiting period, but cooperation and compliance with this procedure are likely to limit the benefits of this treatment, particularly in pre-school children. No large clinical trials have yet shown widespread or proven the benefit of this technique and there have to be reasonable concerns about the likely endurance of any short-term beneficial effects.

For children with Down's syndrome or cleft palate, assessment within a multidisciplinary team is recommended. Children with Down's syndrome generally have very narrow ear canals, and insertion of ventilation tubes can be technically challenging and sometimes impossible. Children with Down's syndrome are more likely to experience episodes of otorrhoea from the grommets, and an associated higher rate of premature extrusion of the tubes. Children with cleft palate, following repair, frequently have persisting problems with middle ear function, and repeated insertion of ventilation tubes, and the insertion of long-term tubes increase the risk of permanent perforation of the tympanic membranes.

For these groups and for children whose parents decline surgical intervention, hearing aids are an alternative to overcome the hearing disability, while not managing the underlying problem of the middle ear effusion. There are associated issues of compliance and acceptability to both children and parents, and then need for regular attendance at audiology clinics to have adjustments to the aids and replacement moulds as the child grows. A small number of children with OME managed by temporary amplification become dependant on their hearing aids, and will wish to continue using them long after the hearing loss has resolved.

Adenoidectomy is often considered as part of the surgical management for recurrent OME, when reinsertion of grommets is

indicated. High level evidence for adenoidectomy at the time of first grommet insertion is not available, but in the age group having grommet surgery, adenoidal hypertrophy with nasal obstruction or persistent and frequent upper respiratory symptoms are common, and adenoidectomy is helpful in addressing these, if not the OME per se. While it is difficult to demonstrate additional benefit to hearing improvement, adenoidectomy has reduced the need for reinsertions and is cost-effective in case having met general criteria for VTs (persistent hearing loss) and for adjuvant adenoidectomy (URTI).

In contrast to tonsillectomy, adenoidectomy is not associated with significant infection or bleeding complications (less than 1:200) during the convalescent period of 3–7 days. With current day-case anaesthetic and surgery techniques, adenoidectomy and grommet surgery is usually performed as an ambulatory care procedure, with minimal morbidity.

Antibiotics are now less commonly prescribed in primary care for acute otitis media in older children, but they remain, against the evidence, a moderately popular but very ineffective treatment for OME there. Other medical treatments with antihistamines, decongestants and intranasal or systemic steroids have also never been convincingly shown to be effective. Some parents seek advice from a homeopath, cranial osteopath or nutritionist, hoping to manage their child's glue ear and hearing loss without recourse to mainstream medical intervention; however, these are of unproven benefit and considered ineffective. For the majority of children, the middle ear effusions will resolve with no treatment, irrespective of medical or complementary intervention. For the minority where resolution does not occur and quality of life aspects of hearing, speech, social or educational performance are adversely affected, surgical management is recommended.

Complications of surgery

Following grommet surgery, otorrhoea can occur either following an upper respiratory tract infection, or water contamination through the grommet. This can lead to blockage of the ventilation tube and/or premature extrusion. Otorrhoea usually responds better to a short course of antibiotic eardrops than systemic antibiotics. Many antibiotic eardrops are potentially ototoxic, and while the observed risk is low, non-ototoxic antibiotic drops (quinolones) are recommended. In the UK, most of these drops, available in other countries as eardrops, are produced as eye drops; these currently have to be used on a named patient basis, additional explanation and consent from the parent of guardian is required.

Myringosclerosis ('tympanosclerosis', 'chalk patch') is a scarring and calcium deposit within the tympanic membrane, and may follow infection, perforation or surgery. It is usually not associated with significant loss of hearing although it can be alarming seen down an otoscope. Persistent perforation is uncommon (2%) with standard ventilation tubes, but may require future surgery to graft and close the perforation. The DH 'Right Care' project quotes a 30% complication rate from grommet surgery, which far exceeds the experience or expectations of most clinicians.

Follow-up

After VTs (grommet surgery), follow-up assessment of hearing is important, and this is highlighted in the NICE guideline. Despite

a normal neonatal screening assessment, occasionally children will present with a mixed hearing loss, with a conductive component caused by OME, with an underlying sensory loss. Target-driven reductions in follow-up appointments limit the follow-up assessments permissible, both in the NHS and currently with at least one of the major private insurers in UK. One assessment between 6 and 12 weeks following surgery and an assessment 6–9 months later following grommet extrusion is a pragmatic minimum follow-up management plan.

Conclusions

While good quality, evidence-based guidance to inform decision-making is available, financial drivers to reduce cost continue to influence commissioning intentions. Around the country, primary care trusts have sought to limit access for children with hearing loss on the basis that it is a temporary phenomenon that resolves over time. It is true that after 12 months, the hearing loss in many children with OME will have resolved and the hearing of those with grommets will be no better than normal. The conundrum that exists is the disadvantage to untreated children and the impact on learning, attentiveness, socialization during a period of 12 months, representing up to a quarter of their total life experience.

The Department of Health agenda is to become more entrenched with the "Right Care" work stream; the stated view is that "restricting access to grommets is not a new phenomenon", and that because the historical evidence for efficacy is based on hearing levels alone, this evidence is limited, despite clinical and parental experience of benefit to domains not routinely assessed in research trials.

While offering every child with OME temporary hearing aids, may be possible, the costs of the aids, repeated clinic visits for adjustments and new moulds, and the difficulties of 'weaning' children off their hearing aids after the OME has resolved add to the financial burden and equal or exceed that of a day-case admission for grommet surgery.

Clinicians agree that with one of the lowest intervention rates worldwide, we continue take a conservative approach to surgery for glue ear, but recommend intervention when spontaneous resolution fails to occur after a period of 3 months of active monitoring. Follow-up to assess hearing post-operatively and after grommet extrusion is essential. ◆

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Practice points

- OME is the most common cause of childhood hearing loss
- Audiometry fails to capture the full social disability resulting from prolonged OME. Initial management is active monitoring with audiometry three monthly during active monitoring
- Surgical management is the effective treatment if resolution fails
- Treatment of OME is subject to political interference and access to treatment is likely to be further limited

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